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Future Directions in Traffic Operations and Safety



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Outline

- What's just around the corner?
 - Improvements in vehicle safety and mobility
- What's over the horizon?
 - Vehicle-Infrastructure Integration (VII)



Provocative Statement:

We will not see dramatic improvements in transportation safety and mobility until the human driver is out of the loop.

- Even with driver warning systems, there is no guarantee that drivers will react in time or take the correct action
- Typical driver behavior creates the “slinky” effect that wastes roadway capacity during peak demand periods

Vehicle Safety

- Crash Worthiness
 - Seat belts, crumple zones, air bags
- Crash Warning
 - Blind spot warning, forward collision warning, lane/roadway departure warning, CICAS-V
- Crash Avoidance
 - Anti-lock braking systems, electronic stability control, brake pre-charging, CICAS-V “+”

Vehicle Mobility

- Adaptive Cruise Control
 - Like conventional cruise control, unless your car overtakes a slower moving one
 - Maintains a pre-set headway based on time or distance
 - Driver “convenience”, not a safety feature
 - Does not work at low speeds (“stop and go”)
- Cooperative Adaptive Cruise Control
 - Adds wireless data communication between the lead and following vehicles
 - Could reduce the “slinky” effect (increase throughput)

National VII Vision

Connecting Vehicles and Infrastructure



Creating an “enabling communication infrastructure”



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VII Can Enable a Wide Range of Safety & Mobility Applications



Traffic Management



Traveler Information

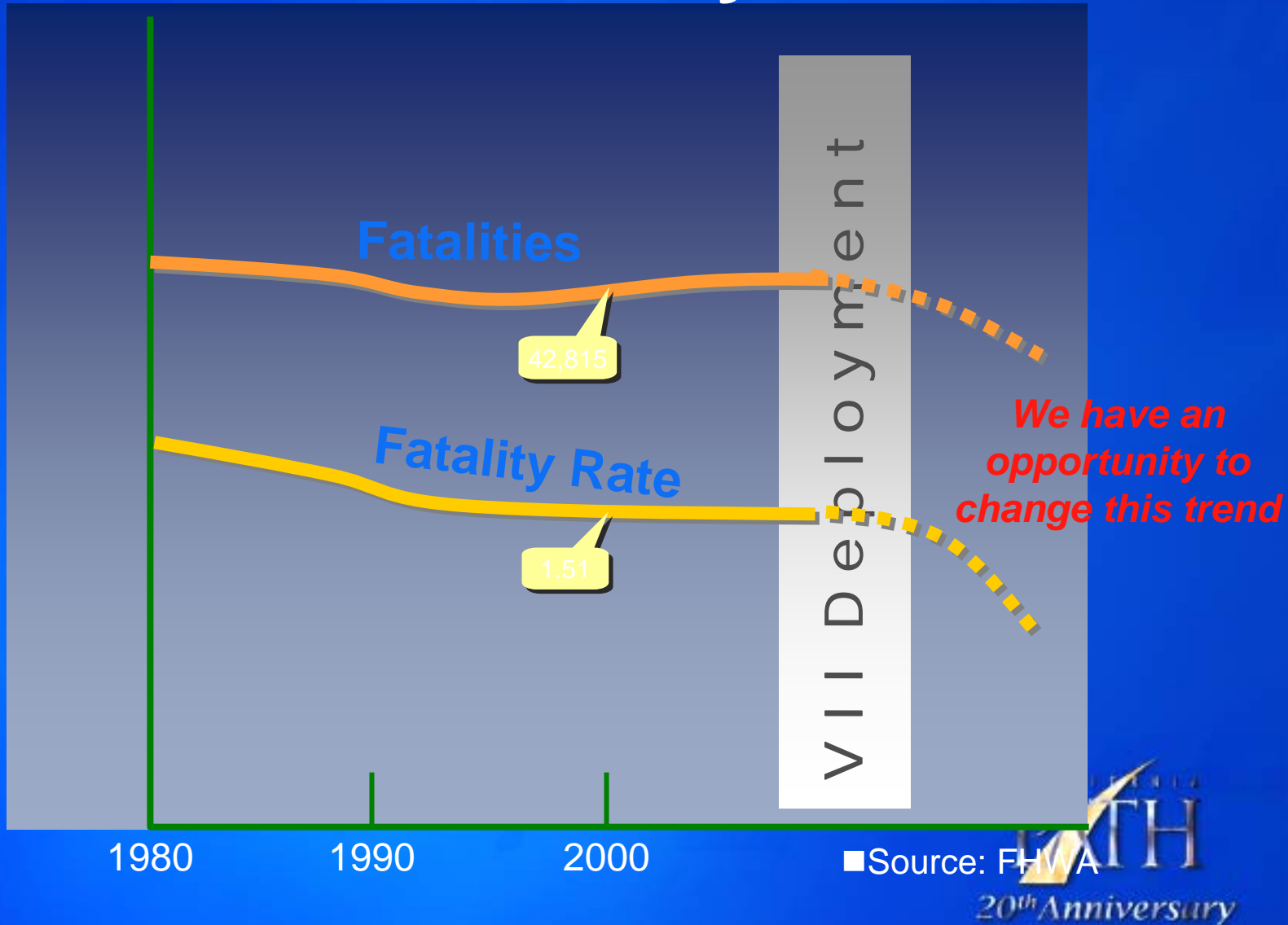


Intersection Collision Avoidance



Weather Sensing

The Need for VII: Safety

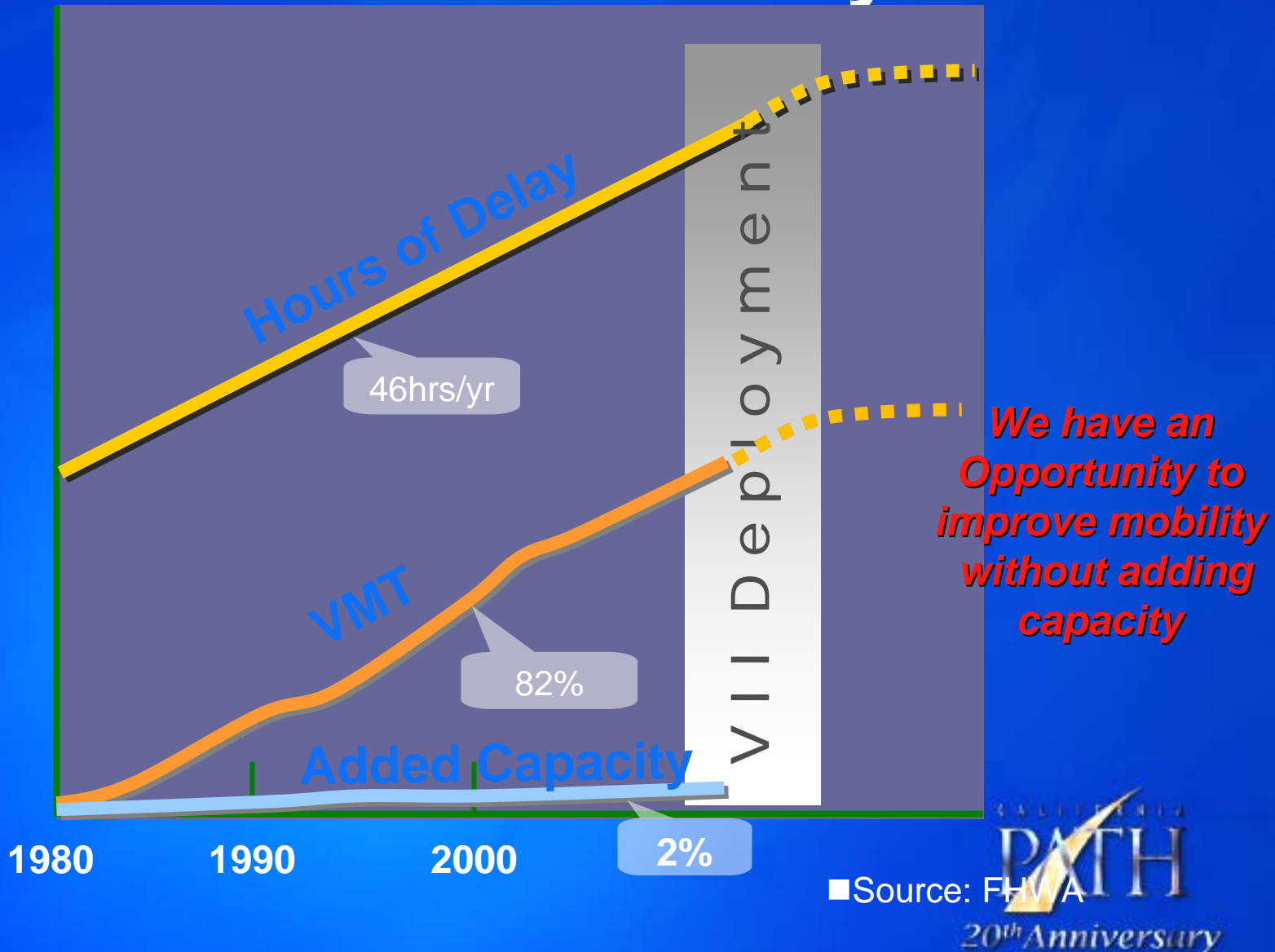


Auto Industry/Government Cooperative VII Research

- Vehicle / Infrastructure cooperation is a critical element for preventing:
 - Intersection crashes
 - Road departure crashes

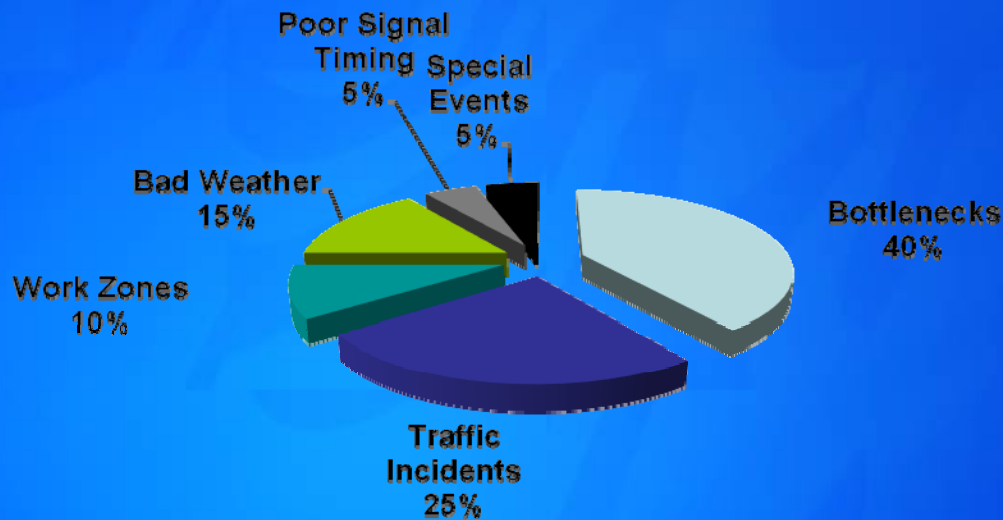
***These two safety problems alone
account for 50% of the
crashes and fatalities on our roads***

The Need for VII: Mobility



Improving Mobility Through System Management and Operations

Sources of Traffic Congestion



**System-wide
Real-time
Information
is the Key!**

■ Source: FHWA

Example: Traffic Management

- Transportation Management Centers are widely deployed in the United States, but traffic sensing and surveillance capability is limited.
- Operations on the highway network could be significantly improved with system-wide availability of real-time traffic information.
- Vehicles could provide:
 - Average speeds
 - Travel times
 - Weather conditions
 - Incidents
- Applications include:
 - Ramp metering
 - Traffic signal timing
 - Emergency response
 - Evacuation
 - Weather management
 - Transit signal priority

Example: Traveler Information

- Current traveler information systems are dependent on limited data.
- Probe vehicles could provide complete network information.
- Tailored information could be ***provided directly to motorists:***
 - en-route alerts
(weather, incidents, emergencies)
 - congestion maps
 - dynamic routing



And Much More . . .

- Safety
 - *Intersection Collision Avoidance*
 - *Roadway Departure Warning*
 - *Emergency Brake Lights*
 - *Cooperative Forward Collision Warning*
 - *Rail Crossing Warning*
 - *Emergency Vehicle Signal Preemption*
- Mobility
 - *In Vehicle Signage*
 - *Traffic Signal Control*
 - *Weather Alerts*
 - *Winter Maintenance*
 - *Traveler information*
- Consumer & Commercial
 - *Electronic Toll Collection*
 - *Drive thru Payment*
 - *Remote Vehicle Diagnostics*
 - *Customer Relations Management*

Ultimate Vision....

...the return of Automated Highway Systems

- VII establishes the enabling technology (wireless communications) that serves as the foundation for AHS
- Additional research, primarily in institutional issues, must be performed before AHS can be viable

Questions?